WATER QUALITY IN ABORIGINAL COMMUNITIES IN LABRADOR:

A STUDY OF THE SOUTHERN INUIT COMMUNITY OF BLACK TICKLE

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APRIL 2015

2012-13 HARRIS CENTRE RBC WATER RESEARCH AND OUTREACH FUND

THE HARRIS CENTRE Memorial University

Water quality in Aboriginal communities in Labrador: a study of the Southern Inuit community of Black Tickle

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Acknowledgements
We would like to thank our funders, the Harris Centre, Memorial University (The Harris Centre – RBC Water Research and Outreach Fund) and the Labrador Institute of Memorial University to make our research possible. We express sincere gratitude to the people of Black Tickle-Domino for unconditional support. We also thank the Black Tickle-Domino Local Service District; NunatuKavut Community Council and Labrador-Grenfell Health Authority and the Health Research Unit (Faculty of Medicine) for technical support.

Sarkar A, Hanrahan M, and Hudson A. (2015). *Water quality in Aboriginal communities in Labrador: a study of the Southern Inuit community of Black Tickle*. Memorial University of Newfoundland, St John's, NL, Canada.

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Executive Summary

Canada has the second highest per capita water consumption in the world. However, little is known about complex socio-economic and cultural dynamics of water insecurities in Aboriginal communities and multiple health consequences. The majority of the studies have concentrated on the very simplified interpretation of accessibility, availability and quality issues, including some common water-borne infections as only health outcomes. Thus, several government initiatives on potable water supply, particularly for the remotely located Aboriginal communities, have failed to sustain and to promote a healthy life.

Anecdotal evidence suggests that there is a pattern of water access and quality problems in Aboriginal communities in Labrador. There are few publications on drinking water quality, health risks and community perspectives in Aboriginal communities in Labrador. Hence, there is a lack of sustainable planning to manage water resources in Aboriginal communities. We took up this serious issue with this study as the starting point. We aimed understanding the multiple dimensions and effects of long-term water insecurity in a remote Aboriginal community in Labrador and to identify coping strategies. Our objective was to know the complex dynamics of water insecurity amongst small and isolated Aboriginal communities and associated health risks.

Our study was based on a community-based survey in Black Tickle, located on Island of Ponds off the Labrador Coast. It is a Southern Inuit community of about 138 people, almost all of whom are members of the NunatuKavut Community Council. It is one of the remotest Inuit communities of Labrador. The community lacks running water, and there is no available system to monitor the quality of water sources (wells, ponds, springs, ice, etc.) on a regular basis. We conducted in-depth, open-ended interviews and focus group discussions with the community leaders, elders, community nurse, women, and high school students. All the water sources were visited and tested their physical, chemical and microbiological parameters.

The community did not have any piped water supply. Their regular sources of water consisted of several unmonitored local streams, brooks, and ponds. The public water system was not affordable to the majority of community members who solely depended on government aid. Animal fecal contamination and the presence of disinfection by-products were the major quality issues. Per capita water consumption was less than one-third of the Canadian national average, severely compromising personal hygiene and food security, especially diet. High-sugar content beverages were the commonest alternative solution, particular for children and the apparent high prevalence of obesity and diabetes in the community was believed to be amongst the possible consequences. Virtually every man in the community suffered from chronic back and shoulder injuries that the community believed were associated with carrying heavy water buckets every day.

Our findings show that the water insecurity in remote Aboriginal communities can result in multidimensional consequences including adverse health, economic, social and cultural impacts. Therefore, a regular supply of affordable, safe drinking water would have far-reaching benefits to the communities.

Introduction

Aboriginal people of Canada and water: general background

The Aboriginal people of Canada are considered to be part of the fourth world because although they are resident in the first world, many are marginalized and live in remote locations.[1] The Aboriginal populations of Canada experienced lower health status than members of the dominant society experiencing a disproportionate burden of morbidity and mortality and having many social, economic and health indicators similar to those in middle-income nations.[2] In 2001, Canada ranked eighth on the UN's Human Development Index. Using the same index, Canada's Aboriginal population ranked 32.[3]

The Second World Water Forum in The Hague (2000) defines water security as *ensuring freshwater, coastal, and related ecosystems are protected and improved; that sustainable development and political stability are promoted; that every person has access to adequate, safe water at an affordable cost to lead a healthy and productive life; and that the vulnerable are protected from the risks of water-related hazards.*[4] Do such conditions exist in Canada's Aboriginal communities?

According to the National Household Survey (2011), approximately 4.3% of Canada's population identify as the Aboriginal. In Canada, there are three distinct categories of Aboriginal people; First Nations, Métis and Inuit representing 60.8%, 32.3% and 4.2% of the total Aboriginal population respectively.[5] First Nations are defined as the Indian peoples of Canada, both status (recognized as Indians under Canada's *Indian Act*) and non-status (Indians or members of a First Nation not recognized under the *Indian Act*). The Métis are the descendants of First Nations people and early Europeans. The word Métis is French for "mixed blood". The people of the Canadian Arctic are known as the Inuit. Formerly, they were called Eskimos which is now considered derogatory.[6]

In 2011, the Auditor General of Canada said that more than half of the water systems on the lands reserved for Aboriginal people posed a medium or high risk of contamination. As of August 2012, almost one out of five First Nations communities in Canada were under water advisories requiring residents to either boil their water or to stop drinking it.[7] Aboriginal homes are 90 times more likely to be without a piped water supply.[3] Water security problems in Aboriginal communities are not limited to drinking water quality but extend to drinking water accessibility and the management of wastewater and sewage. According to the Assembly of First Nations, 75% of the 740 water treatment systems and 70% of the 462 wastewater treatment systems on reserves posed risks to drinking water and wastewater quality.[8]

Water insecurity in Aboriginal communities has been associated with the colonial past. Many Aboriginal people were subjected to coerced relocations to sites with poor land, few water resources, and/or water resources contaminated by development activities such as agriculture or mining.[9] Smaller water systems were more prone to contamination from development activities because these took place closer to smaller communities than large urban centres. Hence, Aboriginal people living in smaller and remote communities are more vulnerable.[10] Aboriginal knowledge of source water protection was gradually eroded due to the systematic promotion of natural resources extraction and management based on western values and approaches.[8]

Aboriginal people intimately connect water with physical and spiritual health and consider water to be the basis of all life. The degradation of water and the environment results in the deterioration of the health and culture of Aboriginal people and communities.[11] Sustainable development in remote areas with little provision for local agencies is difficult to impossible; maintaining or improve conditions is extremely challenging.[8]

Similar conditions have also been witnessed in the Aboriginal communities of other circumpolar regions, such as in Alaska (USA). Almost one in four Alaskan Aboriginal communities lacks complete plumbing facilities.[12] In other words, the residents do not have any running water and sanitation facilities.

Rationale:

It is interesting to note that, according to the World Health Organization's (WHO) 2009 report, both Canada and the USA have 100% access to improved water and sanitation despite dismal record of water security in the Aboriginal communities.[13] Despite several reports of inaccessibility of water and poor quality, researchers have not examined how the small and isolated Aboriginal communities react to the perennial problem and encounter multiple health risks.

We carried out an interdisciplinary study, drawing from anthropology, epidemiology, and the environment, in the community of Black Tickle, located on Island of Ponds off the Labrador Coast. (See Figure 1) It is a Southern Inuit community of about 138 people, almost all of whom are members of NunatuKavut Community Council. The community lacks running water, and there is no available system to monitor the quality of water sources (wells, ponds, springs, ice, etc.) on a regular basis. Hence, there are information gaps related to: the impacts of environmental contamination, the profiles of water quality of the available sources, population vulnerability due to consumption of contaminated water, management and mitigation strategies, and coping mechanisms.

Figure 1: Location of Black Tickle

On account of our limited budget, and the remoteness of the community and its serious water problems, we limited the community-based survey at Black Tickle only. However, the outcome of the research was expected to benefit the entire Aboriginal communities in Labrador.

Our research addressed the issues of water quality, water use patterns, and community perspectives on sustainable water resource management, and future strategies. Black Tickle was selected for the study for the following reasons:

- Black Tickle was the subject of water research a decade ago, revealing such adverse health outcomes as inadequate water intake and outbreaks of occasional gastroenteritis.[14] A small water treatment system in the community is being operated on a user-pay basis. However, this has economic implications for households in a remote community with high unemployment. It was also broken down at times, forcing complete reliance on other sources. The majority of the residents are dependent on community wells and a small water treatment system which is user-pay and unreliable, leading to water access issues. The study provides historical data but needs to be updated to identify changes since that time (this study resulted in the installation of the water treatment system)
- The provincial average of private well use is 24%[15]; it is much higher in Black Tickle, which lacks running water
- A community-based survey completed in 2004[16, 17] provides relevant socio-economic data (e.g. in 2004, 65% of households had incomes lower than $25,000 with most substantially lower)
- The research team has established links with the community; MH's previous work there and AH's status as a NunatuKavut member and a former resident of Black Tickle
- The research team has a substantial capacity to work with Aboriginal communities; MH and AH both have Aboriginal ancestry, MH was Memorial University's Special Adviser to the President for Aboriginal Affairs,
- AS has extensive cross-cultural research experience in Asia and Africa, including on water quality, health in Newfoundland. As the Principle Investigator, he conducted several population-based studies in Newfoundland and Labrador and published several papers in international peer-reviewed journals. He is a physician by training and did PhD in public health along with an additional qualification in environmental studies.

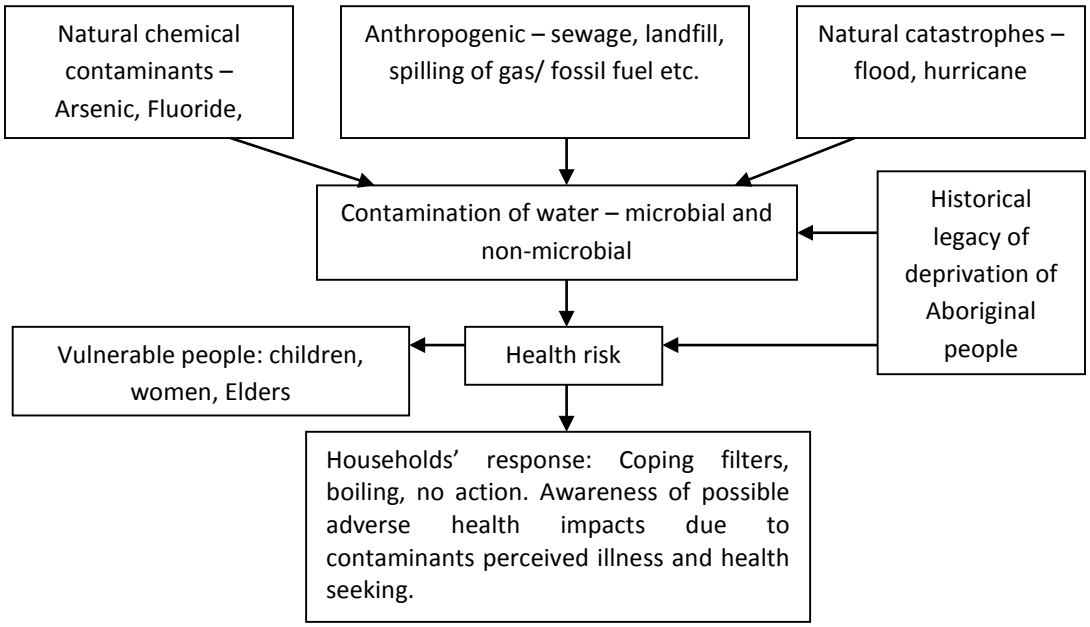
Objectives:

Despite concerns about water quality and access in Black Tickle, there was a felt need to update the community perspectives on sustainable strategy. A crucial part of this was the understanding and incorporation of Aboriginal worldviews about water and water use. There was little information on water quality, the coping mechanisms of the community (especially when the treatment system breaks down). The community needed more current information on alternative sources of potable water, and practical advice on such things as the installation of appropriate filters and risk communication. Therefore, this initial study had the following objectives:

- To determine the water quality (presence of microbiological and chemical contaminants) in Black Tickle and the seasonal changes of water quality
- To explore community perspectives on access to water and its quality, monitoring, usage, sustainable water resource management, health impacts of water contamination, coping mechanisms and future strategies
- To analyze existing reports of water quality, adverse health outcomes, and community response in a Southern Inuit community in Labrador

Theoretical approach:

There are three major possible reasons for water contamination; (1) natural contaminants, (2) anthropogenic activities and (3) natural disasters (figure below). The historical legacy of deprivation still influences water quality and supply and health services in Aboriginal communities. As water sources are not regularly monitored, the community may not be aware of contamination (microbial and non-microbial), and they may be forced to consume contaminated water. In the case of remote communities with economic challenges, like Black Tickle, there may be few alternatives. This adds a social and environmental justice dimension to our project. After the water contamination crisis in Walkerton, Ontario led to seven deaths in 2001, Black Tickle and other Aboriginal communities lobbied for improved water services. But while the Canadian public and legislators were able to identify with the suffering at Walkerton, the more pervasive water problems of Aboriginal communities failed to register. To a large degree, the water problems in Aboriginal Canada remain invisible and, as a result, neglect is the norm.



Methodology:

We visited the community of Black Tickle-Domino in April, 2013 and October, 2013. First the official administration of the community and the Family Resource Centre were contacted to reach out to all the households to seek their participation in focus group discussions and face-to-face interviews. Thus, it was a convenience sample as the subjects were self-selected and volunteered to participate. This sampling method is suitable for studying any small and isolated Aboriginal communities living in remote locations. However, some key informants such as community leaders, the single community nurse, teachers, and elders were also individually approached for in-depth, open-ended interviews. (See discussion points of FGD and broad research questions in Appendix I) After a long history of misuse and abuse of Aboriginal peoples and knowledge by Western researchers, conducting research in Aboriginal contexts made a challenging prospect.[18] However, the Aboriginal background of some of our team members helped us to reach out the community without facing any objection. In fact, some community members facilitated the initial dialogue with the participants.

Three focus group discussions; women's group, high school students, and the local administrative officials were carried out. In these discussions, the emerging themes of water availability, use patterns, quality, perceived health risks, and coping strategies were focused on. This approach allowed us to present residents' perspectives as articulated and prioritized by them, thus more closely reflecting Aboriginal worldviews. The data were primarily qualitative in nature. The total number of adult (32) and adolescent (high school students) (8) participants in discussions and interviews represented almost 30% and 100% of the total population subgroups respectively. All the interviews and discussions and transcribed them for analysis were audio recorded.

All the major water sources (wells, brooks, ponds, and public water) for microbiological contaminations (coliforms), metals and minerals and hydrocarbons were tested and the report of public water from the provincial government website was also analyzed.[19] The microbiological testing was conducted in April and in October to check for any seasonal variations of microbial contamination (coliforms).

An experienced professional transcribed the audio records. Nvivo 9 software was used for analysis of the transcribed (qualitative) data. The analysis is broadly divided into, a) water sources, access and quality, b) coping, c) health risks and, d) challenges to run the public water system.

The major limitation of the study was a low population of the community. According to our spring, 2013 census, the year-round population was only 138. Due to limited resources, more such remote Aboriginal communities in Labrador could not be included. Health and well-being of the Aboriginal society were considered the culturally sensitive issue, and so the community leaders suggested us to avoid individual interviews of the population (except key informants) selected by systematic sampling. Research is still considered a 'dirty word' in the Aboriginal community. After consultations with the regional health authority and the community leaders, convenience sampling was followed and participatory research approach was adopted as prescribed by the Canadian Institute of Health Research Guidelines (Article 3) for Health Research Involving Aboriginal People.[16]

Ethics clearances:

The Health Research Ethics Authority of Newfoundland and Labrador approved this study in 2012 (#12.136), and it was also approved by the NunatuKavut Community Council and the Labrador-Grenfell Health Authority. (See all approval letters in Appendix II) Each participant signed a consent form before interview or discussion. Parents of the high school students signed the respective consent forms before allowing their children to participate in a group discussion. Prior to the signature, printed brief background information about the research was provided, that included the purpose of data collection and how the research would benefit the community. Before ethics approval, all the researchers had to undertake an online training conducted by the federal research agency (Tri-Council). It was mandatory before doing any research in the Aboriginal community.

Results

The residents in Black Tickle-Domino are the descendants of Inuit women from Labrador and men from the British Isles who came to Labrador to fish and trap in the eighteenth and nineteenth centuries. Annual temperatures range from -25°C to +25°C from winter to summer. Snowfall is substantial covering the ground for almost half of the year. There is no regular connection to mainland Labrador, and there are no longer any commercial flights to the island. The seasonal ferry service-operates weekly from around June to November/December, depending on ocean ice conditions. The nearest community, Cartwright, another Inuit community, and it is a 2½-hour snowmobile ride away. Due to Black Tickle-Domino's remote location, there is no power transmission line, resulting in a complete reliance on expensive diesel power for home heating, although wood is also used.

Water sources, access and quality:

There is no piped water system or water truck. The regular sources of water are several unmonitored local streams in the community, brooks, and ponds (Figures 2, 3). Since 2004, the community has had a potable drinking water unit (PDWU) selling water for 2$ (Canadian) per liter. The provincial government irregularly funds the PDWU. Bottled water is intermittently available for purchase at two local stores.

Figure 2: Brook water outside Black Tickle

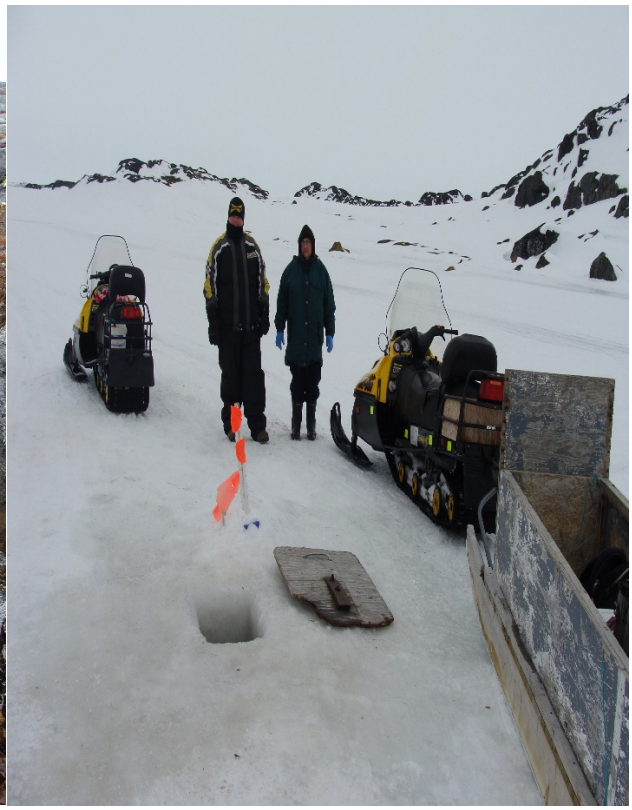


Figure 3: Collection water from a frozen pond

The PWDU is located almost 2 km from the furthest house in Black Tickle-Domino and about 1 km from the nearest house (Figures 4, 5). The PWDU extracts raw water from Herring Cove Pond, located 2 km from Black Tickle, and it conducts a series of treatments. Besides the cost of water, location is also a major obstacle to regular PDWU use, due to high transportation costs e.g. snowmobile gas. Hostile weather, especially heavy snowfalls, and storms is a major obstacle to water retrieval from a favored brook, around 25 km away. Local shallow water pits called 'wells' emerge as water sources, though, in winter and spring, some wells become inaccessible, buried under snow.

Figure 4: Water (free) for general household use


Figure 5: Water for drinking and cooking (inside PWDU)

As regards water quality, the wells are vulnerable to contamination by wild animals' feces and urine. Our water quality testing showed the presence of E Coli in two wells out of seven, all tested in the fall. Many community members do not trust the PDWU due to longstanding attachments to the brook, the high cost of purchasing water, and the frequent breakdowns and closure periods when provincial government funding is unavailable. There is also mistrust in the PDWU site because of animal activity especially muskrat and beaver in and around the source pond. Government reports show a high level of disinfection by-products (DBPs), i.e. Trihalomethanes, and Haloacetic acids in PDWU water samples. The presence of DBPs, known for carcinogenic properties, indicates inefficiency in removing natural organic materials from the water before chlorination.[21]

In most years, during the winter, snow cover enables residents to use snowmobiles and *komatiks* (Inuit sleds) to retrieve water. Winter is the season of greatest mobility and thus, the least difficult time to collect water. Post-winter and early winter are very challenging times for water transportation as there is insufficient snow cover for snowmobiles yet there is too much snow for travel by all-terrain vehicles (ATVs). At times, extreme weather restricted outdoor movements for up to several days. Snowmobiles and ATVs mechanical problems affect water

collection. Some households do not own an ATV or a snowmobile, but there is extensive culturally-reinforced sharing, thus offering some protection to more vulnerable community members, such as lone parents. Residents without such vehicles share fuel costs. Another recent study in Labrador shows that physical health and access to transportation either by ownership, sharing fuel cost or social bonds are the important factors determining water access.[22] *Komatiks* could hold total 14 five-gallon buckets (total 265L) of water (Figure 6) while tow carts attached to ATVs could carry 23 buckets (total 350L). Water retrieval is labour-intensive because of the distance, and the physical effort requires to load, move and unload water. So, several households are limited to one trip per day. Residents use approximately one-third of the Canadian average of 274L of water/day/person.[23] In Canada, about one-third of water usage was for toilets[24] and this figure points to the lack of sanitation practices in Aboriginal communities such as Black Tickle-Domino. Using the WHO standard, traveling more than 100 meters to access water puts the health risk of community members between high and very high.[25]

Also to the costs of water already identified, there are other substantial costs associated with water acquisition, such as *komatik* and tow-cart maintenance holding tanks, boiling, and filters. With the majority of the population depending on government transfers, these costs are difficult to meet, adding a further burden to peoples' quality of life. Widespread poverty limits the ability of most households to purchase bottled water, boil water in their homes or buy drinking water from the PDWU, which, in any case, was irregularly funded and operational. Free, but unmonitored and untreated water from the wells, remained the best option from the perspective of household finances. Due to the lack of a piped septic system, waste is carried on the same *komatiks* used for water retrieval and then dumped in the harbor or the designated landfill site.

Possible health risks:

Gastrointestinal infections are the commonest disease in the community. In the fall of 2012, there was an outbreak of water-borne illness transmission continuing until late 2012. According to the community nurse, its duration was longer than all previous episodes and every household and almost all people were affected.

Official statistics is not available for communities as small as Black Tickle-Domino, but there appeared to be high prevalence Type II diabetes. Several community members stated about several families with multiple cases of Type II diabetes and all were under regular medication. Despite medical advice to have a high water intake, many diabetes patients could not afford to follow this advice. Given the physical demands of water retrieval, study participants reported that virtually every man in the community was in chronic pain due to back and shoulder injuries (Figure 6). Some men required surgery, but they indefinitely postponed it due to the unavailability of alternative persons to retrieve water for their families.

Figure 6: It is man who handles water collection

Mental stress is also associated with water insecurity in the community. Water is always on peoples' minds, especially before storms, hence despite their knowledge of the potential health risks, people consume untreated water and unhealthy high sugar drinks. The residents understood about the linkages between water insecurity and high rates of obesity, and they regretted their high sugar intake, but they expressed a sense of helplessness. One woman explained, "*I gave up diet drinks over a year ago and I was doing very well but then we (the community) ran out of water and when I had to drink water at $1.25 a bottle and I needed four (bottles) a day - there was no water available from the treatment plant (PDWU) – well, I couldn't get fresh or clean water – I couldn't afford to buy four bottles of water a day just for me. Pepsi was all that was available, and Pepsi was cheaper, so I went back on it. The boiled water is disgusting; it tastes disgusting. Pepsi is $1.10 compared to water, which is $1.25.*"

Coping Strategies in Black Tickle:

The coping strategies of the people of Black Tickle can be characterized as either short term or long term. They have a broad knowledge and understanding of their water problem and its implications; they are competent in managing what we see as risk and regretful when circumstances force them to take such risks. This contradicts some anthropological claims that Inuit do not contemplate the future.[26] Edmund Carpenter (1956) asserted this in his influential article, "The Timeless Present in the Mythology of the Aivilik Eskimos." Carpenter did not even believe that Inuit understood that the past had consequences for the present and the future.[27] More recently, geographers have stated that Inuit women coped with food insecurity through strategies that were "largely reactive and short-term in nature".[28] We found, however, that when circumstances forced the adoption of such coping mechanisms, the women of Black Tickle were keenly aware of this and desired more long-term solutions. There was also support for water testing, especially for unmonitored water sources, such as the shared shallow wells. Both men and women embraced the value of water testing in a distant urban lab, and some community members volunteered to be trained in water testing, which was carried out. This adoption of a

long-term strategy also corresponds to Julie Cruikshank's (2004) statement that Inuit are aware of the benefits of being engaged in scientific research, especially as these relate to improvements at the local level.[29]

Planning is not new to the Inuit, nor is what might be termed risk management. Bates (2007:91) argues that Inuit concepts of time and risk are altered with the movement of most Inuit into year-round settlements: "Settlement life adheres to certain timetables and rules, which to an extent structure the lives of contemporary Inuit."[26] In particular, he refers to work contracts and plane trips south and the long-term planning these entail but asserts that, because pre-contact Inuit planned for the future when they deemed it necessary, settled life is "unlikely to have caused a dramatic change in thought process".[26] In this he is correct. For instance, more than anything, the unpredictable weather shapes plane trips in and out of Black Tickle and other remote communities, not the airlines' plans and schedules, which are irregular in this case anyway.

The Southern Inuit of Black Tickle employs multiple methods of coping with water insecurity. Some of these methods are responses to a situation that presents itself and must be resolved immediately, while others are more focused on the future, either with a view to effective coping or reducing water insecurity; thus, some coping activities are short-term while others are long term. In Bates's (2007:96) words, "Rather than rigid planning and prediction, many Inuit instead focus on efficient response and improvisation to whatever reveals itself in the present, alongside a certain amount of general preparation to cater for any eventuality."[26] A number of strategies are under the rubric of short-term coping strategies in Black Tickle: doing without water, conserving, stockpiling and recycling water, making water more palatable, and sharing water-retrieval tasks. More long-term coping strategies include developing local technological innovations and advocating for a better community water system. Yet it must be noted that the sharing of water retrieval tasks, too, has value for the future. As one woman said, "If you share with me when I don't have anything, then I'm going to share with you when you don't have anything." Although food-sharing practices are weakening in some northern Aboriginal communities[27], this does not appear to be the case in Black Tickle.

Doing without is practiced elsewhere among Inuit populations: in a study of food insecurity in the Inuit regions of Canada, over 22% of ever-hungry children had parents or guardians who coped with food insecurity by skipping meals.[30] In Black Tickle, people do without water as well as when necessary, food. There is widespread concern in Black Tickle about the need to do without water, expressed in focus groups and interviews. The need to do without water frequently occurs due to water-access problems such as dried-up wells in summer, winter storms, and other factors, leading to little water consumption levels. One woman said she drank one cup of coffee per day and one glass of water, having "no other choice." Another said, "No one is drinking enough water in the community," with all other focus-group participants agreeing. Even diabetics and others living with chronic illnesses do without water.

Water conservation is general in the community. People who rely on others to collect water for them, mainly female- and elder-headed households, consciously conserve water: "I really take it easy with water because someone else gets my water." Because of the limited water sources in Black Tickle, virtually every household tries to conserve water, especially if a winter storm is expected. We observed stacks of salt beef buckets, in which water is collected, in any homes. An elder explained that his son makes infrequent, sometimes monthly, trips to Porcupine Bay, a former winter station, to retrieve water and wood in large quantities. We saw a dozen or more buckets of water in his kitchen, and he explained that he had many more buckets

elsewhere. The anticipation of winter storms further reduces water usage rates and contributes to the need to stockpile. Recycling water is extremely common in Black Tickle and is necessitated by such restricted access to water. Bath or shower water is used again for waste disposal, which usually means washing out waste containers. Sometimes bath or shower water is shared, which can lead to the spread of disease. Residents report that this "general-use" water leaves a brown cast on bath tubs and kitchen sinks and that it ruins light-colored clothing, which have to be avoided.

Sharing is also widely practiced, as it is elsewhere in the north: over 75% of Inuit children live in homes that share traditional foods.[30] Interestingly, because of sharing in the Inuit community of Igloolik, the poorest households may not be the most food insecure.[27] This may well be the case in Black Tickle. During the most recent and other research trips, we observed frequent and significant—and very deliberate—sharing with the widow and lone parents. In turn, widows and lone parents were highly conscious of others' generosity and responded by using water extremely sparingly.

Some extended families share water-retrieval tasks. When a household head cannot retrieve water for himself or herself, they pay others to do it, subsidizing the gas and other costs of water retrieval. This can be a small, if not token, amount. Members of extended families, who may live in different houses, share water collection duties, sometimes through a formal system they have set up. For instance, in one case,

> *We get our water and my husband gets his dad's water, and we have his brother (who is) out on the boat (working) with family left home so they have to contend with their water, they buddy up. We have a couple of men from each of the households buddy up—one day, A will do it, the next day B will go do it. . . . We do it now for four homes.*

Parents struggle internally with the limited water choices available to their children and, thus, try to make water more palatable. Kool-Aid, which is not a nutritious, rather processed drink item, has been used for many years to mask local water, including the brown-cast PWDU water. A bottle of soda pop costs 15¢ less than a bottle of water at the local store and is more consistently available—so the choice is made to consume soda pop, although residents express concern about this and are acutely aware of how excess soda-pop consumption compromises health. This is a source of stress as residents are aware of the relationship between water consumption and good health, having been taught about it by their parents and grandparents. They point out that their parents were healthier than they are and attribute this at least partly to previous generation's better access to water while moving with the seasons in Aboriginal patterns.

In terms of long-term coping strategies, residents use some local technological innovations. Some households use water-holding tanks. These are fish tubs procured from the former fish plant or elsewhere and are usually located in basements. Other people rig pipes in to carry waste from their homes to the nearby harbor, but the lack of water pressure can render this technology ineffective. Some people attach a hose to a well in the summer season and bring it down to their houses, which is an option available to those who live near the wells. Although they improve water access, none of these innovations makes water potable.

Advocating for improvements is another—and time consuming—long-term coping strategy. There have been no improvements to the water situation in Black Tickle since the PWDU was set up in 2004. Yet residents continue to form committees, meet with their representatives in the provincial government (the Member of the House of Assembly for Cartwright-L'Anse-au-Clair) and the federal government (the Member of Parliament for

Labrador), contact bureaucrats in the provincial and national capitals of St. John's and Ottawa respectively, and work with NCC, the umbrella Aboriginal organization of the Southern Inuit of Labrador. At present, they are working on our project as research participants and community development partners. Their work is done as volunteers and reflects persistence, resilience, awareness of water-related health concerns, and orientation to the future.

Food Insecurity:

In Black Tickle, almost every conversation about water insecurity turns to the topic of food insecurity. There are few studies on water security in Inuit communities; a notable exception is an article by Goldhar et al. (2013) that examined water security in Nunatsiavut to the north of Black Tickle.[31] There is some literature on the related issue of food security, which has relevance here in our view and in the view of the residents of Black Tickle. Food insecurity is a widespread problem in northern Canada, with the region's Inuit population indicating prevalence of insecurity between 50% and 80%.[32] A high prevalence of food insecurity among Inuit women in Igloolik has been reported.[27] One study found that one in four Inuit children experienced hunger, according to their parents.[30] According to this study, factors associated with food insecurity include socio-demographic characteristics, such as income, household size, with "cultural activities" (such as sharing wild foods[30]), poverty, environmental conditions, hunting costs, store-food availability and knowledge, budgeting skills, and other factors.[27]

Food insecurity is ongoing in Black Tickle, and it is linked to water insecurity. Some of the factors cited in the literature are present, such as poverty, hunting costs, and the practice of sharing wild foods. Water insecurity adds another complex factor. Residents pointed out in focus groups that obesity (their word) rates are high, which is observable and was confirmed in our interview with the relief nurse practitioner. Residents' understanding of the linkages between water insecurity, food insecurity, and community health is well developed. Many regrets that their sugar intake can be high. As one woman explained,

> *I gave up diet drinks over a year ago and I was doing very well but then we (the community) ran out of water and when I had to drink water at $1.25 a bottle and I needed four (bottles) a day—there was no water available from the treatment plant (PWDU)—well I couldn't get fresh or clean water—I couldn't afford to buy four bottles of water a day just for me. Pepsi was all that was available and Pepsi was cheaper, so I went back on it. The boiled water is disgusting, it tastes disgusting. Pepsi is $1.10 compared to water, which is $1.25.*

Thus, there is a clear understanding of the correlations between water and food insecurity and obesity.

Women taking part in a focus group estimated the obesity rate to be 80%, which seems accurate. "A lot of the obesity has to do with the fact that there's not enough water; there's an access problem to water," said one resident. Prior to the installation of the PWDU and the importation of bottled water, both about a decade ago, people became habituated to drinking sweet juice type drinks and to masking the salty taste of well water by adding Kool-Aid for their children, as well as for themselves, as we have seen. With the forced seasonal reliance on government transfer payments, institutionalized further with the fish plant closure, hunger satiation is a long-term problem. In the north, food items are expensive, particularly perishables[30]; this is true of Black Tickle with all milk, fruit, and vegetables being flown in. Out of financial necessity, parents often purchase the cheapest and most filling available food.[30] As one woman explained,

> *When you're buying your kids lunch at the store, you can spend $1.15 for one orange or $1.25 for a bag of chips (crisps). The orange is not fit to eat, it's moldy, and the peel falls off it right away. The store won't*

take a refund so you can't give your child that nutritious item, that nutritious orange. On the other hand, they can go back to school on a full belly with a bag of chips, which is not nutritious but at least they're not hungry. You're damned if you do and damned if you don't: it's a full belly or nutritious food.

The dual food system that characterizes many Inuit communities[33] exists in Black Tickle, with people consuming harp and other seals, Canada geese, caribou, murres, gull eggs, ptarmigan, and various berries. But it is threatened by the high costs of hunting in combination with widespread poverty cited elsewhere as a factor in food security among Inuit[33]. Most Inuit, including the Southern Inuit, now use expensive snowmobiles to hunt instead of dog teams. In Black Tickle, as in much of the north[33], employment opportunities are limited, and unemployment is high. Historically, paid employment in Black Tickle is seasonal, but even this form of employment has become precarious with the 2012 closure of the fish plant, formerly the community's main employer. Meanwhile, the alleviation of high poverty rates is a key challenge to improving Aboriginal health: "as long as Aboriginal people experience a higher prevalence of poverty than Canadians in general they will bear a disproportionate vulnerability to climate change"[33] and, we would argue, other health-related challenges. Thus, the long-term gap in health status reflects the power imbalance between Aboriginal people and the Canadian state and society.

Conclusion

This case study of one of Canada's remote Aboriginal communities has provided a multidimensional picture of the dynamics of water insecurity and population vulnerability. Water insecurity in Black Tickle-Domino constitutes violations of (a) Canada's constitutional obligations to First Nations, Inuit and Metis[34] and (b) United Nations resolution (#64/292, dated 28th July 2010) of the human right to water and sanitation.[35] It is ironic that Canadians are the world's second-largest per capita users of water while its Aboriginal citizens are deprived of basic water and sanitation. The Southern Inuit of Labrador live on the edge of North America as part of the sovereign state of Canada and the province of Newfoundland and Labrador; neither government prioritizes their basic needs such as water. We are well into the ongoing colonial project and Aboriginal people are forced to shape and reshape responses to various aspects of this project on a daily basis. In the case of Black Tickle, this means living with severe water insecurity and, according to WHO standards of water access, associated significant health risks. Recently Black Tickle-Domino has drawn media attention for the further deterioration of its water security. After the collapse of PDWU, residents resorted to collecting water from local ponds and drain-off ditches.[36]

Residents associate water insecurity with numerous community health issues, including mental health, men's musculoskeletal health, chronic-disease management, gastrointestinal illness, food insecurity, and related problems. Working with the community, we identified a range of innovative coping strategies, both short term and long term, the persistence of which are evidence of enduring community and cultural resilience.

Water insecurity has not only put Aboriginal communities at risk of water-borne infections, it has made them vulnerable to other serious adverse health outcomes, such as obesity, diabetes, gastritis and stomach cancer and influenza. Obesity and diabetes among Canada's Aboriginal populations have reached an epidemic proportion. The prevalence of obesity is particularly high among First Nations people: adult men (32%), adult women (41%), youth (14%) and children (36%) were considered obese.[37] The overall obesity rate among First

Nations (36%), Métis (26%) and Inuit (24%) is higher than that of non-Aboriginal people (17%).[38] Age-standardized rates show the prevalence of diabetes was 17% among First Nations and 7% among Métis, compared to 5% in the non-Aboriginal population. Aboriginal individuals are often diagnosed at a younger age, and complications, such as renal diseases, are more frequent than among the non-Aboriginal population.[39] In fact, the high rate of diabetes among Aboriginal people is the primary contributing factor to the rising rates of chronic kidney disease.[40] A diet high in sugar is considered to be one of the reasons for the upward trend of obesity and diabetes. But none of the scientific reports has mentioned the role of water insecurity as a major modifying factor for changing diet. Our case study, however, shows water insecurity and poverty have resulted in a high intake of cheap sugary beverages as an alternative to water, particularly among children. Water insecurity has also prevented diabetics from receiving an adequate intake of fluids, which makes them potentially vulnerable to related complications.

Helicobacter pylori infection is one of the risk factors for gastritis and stomach cancer with studies showing that it may spread most readily through either vomiting or diarrhea during acute gastroenteritis caused by other agents. Poor water and sanitation are believed to be the primary reason for the very high prevalence of *H pylori* infection in Canadian and other Arctic Aboriginal populations.[41,42] Not surprising, a recent systematic review shows a very high burden of stomach cancer in Aboriginal communities; the incidence and mortality rates are up to fivefold that of non-Aboriginal populations and the incidence appears to be increasing in several Aboriginal populations. Poor sanitation and *H pylori* infection are blamed for this scenario.[43]

In 2009, when the H1N1 influenza pandemic hit Canada, there were disproportionate effects in many Aboriginal communities.[44] Recommended infection control measures such as frequent hand washing, was impossible in communities like Black Tickle-Domino.

As Inuit and other Aboriginal people grapple with the colonial project, social science and science can offer opportunities for genuine partnerships that advance their causes and meet their needs. Cross-cultural collaborations and interdisciplinary research is vital to arctic scholarship[45] and certainly to the identification and implementation of solutions to pressing social and health problems. Water as a human right has been institutionalized at the international level. High-level discussions about water as a human right take place far from local communities, where decisions about water, in Canada, for instance, are made by municipalities, Aboriginal governments, or provincial governments. This means that the concept of water as a human right, while laudable, may have limited use. Given the nature of international institutions, who will enforce this right? Participation of the local community is vital if culturally appropriate solutions are to be identified and developed; this is true nowhere more than in Aboriginal communities. In this case, the Southern Inuit ought to be included in local water assessments, which should be multidimensional, consisting of more than water testing. Anthropologists can continue to use ethnography to show how "particular local formulations can continue to complicate—and surprise—universalising, common sense, expectations about what we mean by knowledge".[29] Working with Aboriginal people, this can help us shape possible solutions, going beyond our perennial identification of problems. As Joslyn Cassady (2007:87) asserts, "there is dire need for a more materialist, as opposed to discourse-based, approach."[45] We hope this is the case as our work on water insecurity and our relationship with the people of Black Tickle continues.

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Appendix I

1. Discussion points for FGD

- Quality of drinking water in the community
- Current water quality monitoring system
- Known environmental contamination/s in the area, possible impacts on water
- Community and household level management and mitigation strategies (on water contamination)
- Coping mechanisms (if management and mitigation strategies fail to restore water quality)
- Community perspectives of high risk groups (gender, age, occupation, etc.)
- Community partnerships in future collaborative efforts on improvement of water quality and access

2. Broad research questions for interviews

(Note: The following questions are not a final version. More questions will be added after consultations with stakeholders.)

A) Community leaders and members

- What does water mean to people in this community?
- What are the issues related to the quality of drinking water in your community?
- What are the current water quality monitoring systems available in your community?
- Are you aware of any incidence/s of environmental contamination/s in your area? If yes, is/are there any impact/s of environmental contamination/s on the quality of water?
- Is your area flood prone? If yes, was there any report of water contamination due to flood water and how was it managed?
- How do the community and households manage water contamination?
- What are the alternatives, if management and mitigation strategies fail to restore water quality?
- Who are the more vulnerable to contaminated water?
- How do you manage sewage and solid waste in your community?
- Was there any episode of outbreak of waterborne diseases in recent past? If yes, what are main reasons and how were they managed?
- As a community leader what kind of proactive role will you be able to play in future collaborative actions?
- What kind of support do you expect from municipality, regional health authority and the provincial government?

B) Health officials (local/regional health authority)

- What are the issues related to the quality of drinking water in the community/region?
- What are the current water quality monitoring systems available in your community/region?

- Are you aware of any incidence/s of environmental contamination/s in your area/region? If yes, is/are there any impact/s of environmental contamination/s on quality of well water?
- How do the health authority, community and households manage well water contamination?
- What are the alternatives, if management and mitigation strategies fail to restore well water quality?
- What are the current practices of sewage and solid waste management the communities?
- Is there any episode of outbreak of waterborne diseases (such as E coli, Beaver fever etc) in the community/region? If yes, what are main reasons and how were they managed?
- Who are the more vulnerable to contaminated well water?
- How can your department take part in future collaborative efforts on improvement of private well water quality?
- As a health official what kind of proactive role will you be able to play in future collaborative actions?
- What kind of support do you expect from community, municipality, and the provincial government?

C) DOEC Officials

- What are the current provincial policies to improve water quality? What are the future strategies and priorities?
- How do you coordinate with other departments such as health and community services, natural resources etc, to monitor the wells?
- What are the public health risks of unmonitored water intake from private wells? How do you communicate risks with the communities and other departments?
- Are there any alternative mechanisms to assess the public health risks of private wells, such as GIS?
- Can you share the policies of water monitoring of other Canadian provinces?
- Does the department have specific environmental or water-related policies for Aboriginal communities?
- Does the department work with Aboriginal governments and organizations on water management issues?

D) DOHCS Officials

- What are the current provincial policies to improve water quality, particularly the private sources? What are the future strategies and priorities?
- How do you coordinate the monitoring of microbiological quality (coliform) of groundwater in the province?
- How do you respond to any outbreak?
- What are the challenges in routine monitoring for remote Aboriginal communities?

- What are the public health risks of unmonitored water intake from private wells? How do you communicate risks with the communities and other departments?
- Are there any alternative mechanisms to assess public health risks, such as GIS?
- Can you share the policies of water monitoring of other Canadian provinces?
- Does the department have specific environmental or water-related policies for Aboriginal communities?
- Does the department have specific policies for Aboriginal community health?

E) NCC Officials

- What are the water quality and access issues in coastal NCC communities?
- Do water quality and access issues differ greatly in coastal NCC communities?
- What are NCC's goals and plans regarding these issues?
- Does the NCC currently play a role in assisting the people of Black Tickle cope with their water difficulties?
- Are there any factors/barriers that limit the NCC's role in assisting the people of Black Tickle cope with water difficulties?
- What would the NCC like to see as an outcome of this research?

3. Format for water sample

General identification
Sample No:
Date and time of water collection
Name of the community
Name of the owner of the source (if any)

Description of the source
Type (drill/dug/pond/ice any other)
Location (distances from sewage, septic tank, road, garage, river/pond and any abandoned well, also whether is located in a flood prone land)
Maintenance (including routine water quality monitoring)
Past report/s of water quality test

Use of source
Domestic purpose (cooking, drinking, pets, washing, bathing, and other)
Household treatment of water (no treatment/direct intake, boiling, chlorination, filter (type))

Past history of contamination
Any history of contamination, nature of contamination
Actions taken to clean

MEMORIAL UNIVERSITY

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July 10, 2012

Dr. Atanu Sarkar
Assistant Professor of Environmental and Occupational Health
Faculty of Medicine
Rm: H 2851, Health Sciences Centre
Memorial University of Newfoundland
St. John's, NL A1C 5S7

Dr. Maura Hanrahan
Adjunct Professor
Faculty of Medicine
Rm 2014
Memorial University of Newfoundland
St. John's, NL A1C 5S7

Dear Dr. Hanrahan and Dr. Sarkar:

On behalf of the Labrador Institute of Memorial University (LI), I am pleased to offer our support for your research on water quality in Labrador's aboriginal communities. The LI is committed to supporting Labrador communities, and your project promises to deliver important insights into a matter of extreme importance to the people of Black Tickle, and by extension and analogy, to the wider population of southern Labrador.

The Labrador Institute has demonstrated long-term commitments to aboriginal health through the work of Dr. Rebecca Schiff and through several ongoing Ph.D. research projects, as well as through our partnership in an Inuit Bachelor of Social Work program. We have also begun to specifically address questions of water quality, by sponsoring a project to investigate traditional knowledge of drinking water sites and by appointing Dr. Marie Clément as Aquatic Ecologist, in a cost-shared position with the Marine Institute. We are therefore fully invested in supporting research in both of these areas, and to further this commitment, we are happy to contribute $6,000 in funding to offset your project's costs and to help ensure its successful delivery.

I wish you both the best of luck in your research. Should you have any questions, please do not hesitate to ask.

Best regards,

Keith Chaulk, PhD
Director

Labrador-Grenfell Health

September 24, 2012

Dr. Maura Hanrahan, Dr. Atanu Sarkar,
Community Health and Humanities
Faculty of Medicine
Education Building
Memorial University
St. John's. NL

Dear Drs. Hanrahan and Sarkar,

The Labrador-Grenfell Health Research Review Committee has reviewed your proposed research project titled "Water quality in Aboriginal communities in Labrador: a study of the Southern Inuit community of Black Tickle" and given approval for it.

However, an aspect of your proposal merits attention. Statements in response to questions 13 and 18 indicate that you will use 'secondary data' on "health information like water-borne diseases, outbreaks" and you "will access aggregate health service data." An assumption appears to be made that such information or aggregate data for the community of Black Tickle is available, or can readily be retrieved, and/or can be provided to you. As your proposal does not state how health information will be obtained, your expectations may not be met either because data is absent or considered confidential.

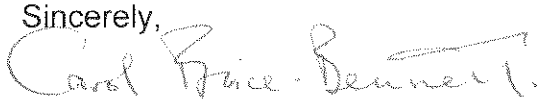
We recommend that you contact Labrador-Grenfell Health's Regional Director of Environmental Health, Ms. Michele LeBlanc-Havard, for any information you require on health-related aspects of water quality in Black Tickle. She can be reached by e-mail at Michele.leblanc-havard@lghealth.cs or by phone at 897-2342.

I have also been advised that the RN in charge of the clinic will be away during your intended visit in the week of October 12, 2012. Nevertheless, the nurse or other clinic staff cannot speak on behalf of Labrador-Grenfell Health regarding health-related aspects of water quality in Black Tickle, although they can make personal comments as community residents.

Once your study is complete, please send an electronic copy of the report to me for distribution within our organization.

Best wishes for the success of your project.

Sincerely,



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Ethics Office
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August 24, 2012

Dr. Maura Hanrahan
C/O Atanu Sarkar
ED2014 Education Building
Memorial University

Dear Dr. Hanrahan:

Reference # 12.136

RE: Water quality in Aboriginal communities in Labrador: a study of the Southern Inuit community of Black Tickle

This will acknowledge receipt of your correspondence.

This correspondence has been reviewed by the Chair under the direction of the Board. ***Full board approval*** of this research study is granted for one year effective **August 9, 2012.**

This is to confirm that the Health Research Ethics Board reviewed and approved or acknowledged the following documents (as indicated):

- Information letter
- Consent form

MARK THE DATE

This approval will lapse on **August 8, 2013**. It is your responsibility to ensure that the Ethics Renewal form is forwarded to the HREB office prior to the renewal date. *The information provided in this form must be* ***current to the time of submission*** *and submitted to HREB* ***not less than 30 nor more than 45 days*** *of the anniversary of your approval date.* The Ethics Renewal form can be downloaded from the HREB website http://www.hrea.ca.

The Health Research Ethics Board advises THAT IF YOU DO NOT return the completed Ethics Renewal form prior to date of renewal:

- *Your ethics approval will lapse*
- *You will be required to stop research activity immediately*
- *You may not be permitted to restart the study until you reapply for and receive approval to undertake the study again*

Lapse in ethics approval may result in interruption or termination of funding

It is **your responsibility to seek the necessary approval from the Regional Health Authority or other organization as appropriate.**

Modifications of the protocol/consent are not permitted without prior approval from the Health Research Ethics Board. Implementing changes in the protocol/consent without HREB approval may result in the approval of your research study being revoked, necessitating cessation of all related research activity. Request for modification to the protocol/consent must be outlined on an amendment form (available on the HREB website) and submitted to the HREB for review.

This research ethics board (the HREB) has reviewed and approved the research protocol and documentation as noted above for the study which is to be conducted by you as the qualified investigator named above at the specified site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Health Research Ethics Board currently operates according to *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans; ICH Guidance E6: Good Clinical Practice* and applicable laws and regulations. The membership of this research ethics board is constituted in compliance with the membership requirements for research ethics boards as defined by *Health Canada Food and Drug Regulations Division 5; Part C.*

Notwithstanding the approval of the HREB, the primary responsibility for the ethical conduct of the investigation remains with you.

We wish you every success with your study.

Sincerely,

Patricia Grainger, Acting Chair
Health Research Ethics Board

C C VP Research c/o Office of Research, MUN
VP Research c/o Patient Research Centre, Eastern Health
HREB meeting date: September 6, 2012